COMMITTEE ON
THE CHALLENGES OF
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Clean Products and Processes
(Phase I)

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2002 Annual Report
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Clean Products and Processes
(Phase I)

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U. S. Environmental Protection Agency
Kaunas University of Technology
Institute of Environmental Engineering
Kaunas, Lithuania

NOTICE

This report was prepared under the auspices of the North Atlantic Treaty Organization's Committee on the Challenges of Modern Society (NATO/CCMS) as a service to the technical community by the United States Environmental Protection Agency (U.S. EPA). The views expressed in this Annual Report are those of the individual authors and do not necessarily reflect the views and policies of the U.S. EPA. This report has been reviewed in accordance with U.S. EPA's administrative review policies and approved for publication. This document was produced as a result of a cooperative agreement with the U.S. EPA's National Risk Management Research Laboratory (NRMRL), Cincinnati, Ohio, under the direction of Dr. Hugh McKinnon, and the Institute of Environmental Engineering, Kaunas University of Technology, Kaunas, Lithuania. This Annual Report was edited and produced by Daniel J. Murray, Director of NRMRL's Technology Transfer and Support Division and Richard Dzija, of Science Applications International Corporation. Mention of trade names or specific applications does not imply endorsement or acceptance by U.S. EPA or Kaunas University of Technology.

PREFACE

The Council of the North Atlantic Treaty Organization (NATO) established the Committee on the Challenges of Modern Society (CCMS) in 1969. CCMS was charged with developing meaningful programs to share information among countries on environmental and societal issues that complement other international endeavors and to provide leadership in solving specific problems of the human environment. A fundamental precept of CCMS involves the transfer of technological and scientific solutions among nations facing similar environmental challenges.

The concept of sustainable development, universally accepted as the means of protecting the environment for all mankind, demands that future manufacturing technologies must be cleaner, yet economically sound. With continued industrialization and an improving standard of living among nations, and with increasing globalization of markets and means of production, all nations by and large are facing similar environmental challenges in the manufacturing sectors. We established this pilot study on Clean Products and Processes to create an international forum where current trends, developments, and know-how in cleaner product design and technologies, and in tools for measuring their cleanliness, can be discussed, debated, and shared. We hope that this pilot study, through its annual meetings, will continue to stimulate productive interactions, cooperation and collaboration among national experts, with the expected benefits of effective technology transfer.

The fifth annual meeting of the pilot study, held in Vilnius, Lithuania, on May 12–16, 2002, marked the completion of Phase I of the pilot study and the initiation of Phase II. The meeting continued the traditions established by the previous four meetings held in Cincinnati, Ohio, United States; Belfast, Northern Ireland, United Kingdom; Copenhagen, Denmark; and Oviedo, Spain. The meeting was hosted by Professor Jurgis Staniskis, Institute of Environmental Engineering, Kaunas University of Technology, Kaunas, Lithuania. Twenty nations were represented at the meeting. The meeting included the traditional tour-de-table presentations and updates of pilot projects. The special one-day symposium focused on industrial ecology and included technical presentations by international experts and examples of practical applications of industrial ecology in several Lithuanian industries. The meeting also focused on successful cooperative relationships between universities and industry in Lithuania, Spain, the United Kingdom and the United States.

The fifth annual meeting marked the completion of Phase I of this pilot study and the initiation of Phase II. The meeting included with an evaluation of Phase I which highlighted the many productive and cooperative relationships developed during Phase I. The meeting concluded with a reaffirmation of the mission and goals of the pilot study and a commitment by the national delegates to work together, over the next five years, to achieve the goals of Phase II.

Subhas K. Sikdar, Pilot Study Director
Daniel J. Murray, Jr., Pilot Study Co-Director

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INTRODUCTION

During the fourth NATO/CCMS Pilot Study on Clean Products and Processes meeting held in Oviedo, Spain on May 6–11, 2001 the delegates attending the meeting suggested that the fifth meeting could take place in Vilnius, Lithuania.

The distinctive feature of the meeting held in Vilnius, Lithuania was discussion of the integration of Industrial Ecology and Clean Products and Processes.

"Industrial ecology is the means by which humanity can deliberately and rationally approach and maintain a desirable carrying capacity, given continued economic, cultural and technological evolution. The concept requires that an industrial system be viewed not in isolation from its surrounding systems, but in concert with them. It is a system view in which one seeks to optimize the total materials cycle from virgin material, to finished material, to product, to waste product, and to ultimate disposal. Factors to be optimized include resources, energy and capital." (*Industrial Ecology*. T.E. Graedel and B.R. Allenby. Prentice Hall, New Jersey, 1995.)

Industrial ecology can be considered the "production" component of sustainable development. The most important aspect of industrial ecology is the idea of industry as a system in which there is no waste at any step because all "waste" is a resource for another part of the industry network. This concept is thus one of the relationships and dynamics between companies, research and governmental institutions.

Industrial ecology is still a very new concept, and is not recognized by most industry executives. It requires an understanding of the basic principle of ecology, which is a set of dynamic feedback systems. It is still too early for industrial ecology to be widely used in promoting behavior changes of industry or even in getting its attention, but the principles of zero waste and maximum efficiency through materials exchanges will attract the interest of executives once we have their attention through the dissemination of concepts such as CP.

Industry has tremendous opportunities for applied industrial ecology. The unavoidable wastes of many companies could be turned into new products by others if enough willpower is focused. Designing products to do more with less increases the industrial system’s metabolic efficiency, as does using inputs derived from natural renewable sources such as plant stocks instead of non-renewable resources. Increased vertical and horizontal integration can create significant competitive advantages, as well as increase management and product efficiencies.

Forty-six representatives from a number of countries participated in the meeting. This new NATO/CCMS Pilot Study report reflects most of the topics presented at the meeting.

During the field trip, three Lithuanian companies in the Alytus region were visited; practical studies of their environmental performance have been conducted.

I would like to thank the Lithuanian governmental institutions and companies that generously supported the meeting, particularly the Lithuanian Ministry of National Defence, the Ministry of Environment, JSC "Alytaus tekstilė," JSC "Alita" and JSC "Snaigė."

I would like to express special gratitude to His Excellency, Lithuanian President Valdas Adamkus, who kindly welcomed participants in the President's Office.

I am also grateful to colleagues from the Institute of Environmental Engineering for their help in organising the meeting.

Jurgis Kazimieras Staniškis
Professor, Director of the Institute of Environmental Engineering
Meeting Host

EXECUTIVE SUMMARY

The 5th annual and concluding meeting of Phase I of the NATO CCMS Pilot Study, Clean Products and Processes, was held in Vilnius, Lithuania, from May 12 to 16, 2002. Although attendance was somewhat smaller this year than last year, this meeting ran well and ended with great optimism for Phase II, the approval of which was communicated to us by the office of Ms. Wendy Grieder, the US EPA CCMS representative. The success of this meeting was owed largely to the able organization and leadership of Prof. Jurgis Staniskis of Kaunas University of Technology. The meeting was sponsored by NATO CCMS, US EPA, the Ministry of National Defense Republic of Lithuania, and the Ministry of Environment, Republic of Lithuania. The delegates enjoyed the rare opportunity of having a half-an-hour meeting with Mr. Valdas Adamkas, the President of the Republic of Lithuania. In last year's meeting in Oviedo, Spain, we decided to shorten the duration of the meeting from four and a half days to three and a half days. Thus the Vilnius meeting was concluded on Thursday.

The Vilnius meeting began on Sunday May 12 with registration, introduction of the delegates, some pilot project updates and tour de table presentations, and continued until Thursday noon with technical presentations, software demonstrations, and trips to industrial sites that practice cleaner production. It concluded with a wrap-up discussion and planning for Phase II.

Here is a summary of the various activities:

Monday May 13

Monday May 13 was marked by a one-day conference on Industrial Ecology, which was particularly significant because of the opening talk by Mr. Arunas Kundrotas, the Minister of Environment, Republic of Lithuania. Monday afternoon the delegates had a special meeting with the President of Lithuania. The titles of the symposium talks are:

- From pollution to industrial ecology and sustainable development: Prof. Lennart Nielsen, Royal Stockholm Technical Institute (Sweden)

- Industrial ecology and eco-efficiency, introduction to the concepts: Prof. Anik Fet, Trondheim Technical University (Norway)

- Extended producer responsibility in cleaner production: Dr. Morten Karlsson, Lund University (Sweden)

- Strategies and mechanisms to promote cleaner production financing: Ari Huatala (UNEP, Paris)

- Cleaner production financing: possibilities and barriers: Dr. Zaneta Stasishiene, The Institute of Environmental Engineering (Lithuania)

- Industrial ecology in university curricula: new international MSc program in cleaner production and environmental management (Lithuania)

- Chemical risk management in enterprises: Dr. Jolita Kruopiene, The Institute of Environmental Engineering (Lithuania)

- Practical implications of industrial ecology in Lithuanian industry:

    - Electronic industry: Vaclovas Sleinota (Vilniaus Vingis)
    - Textile industry: Nerijus Datekunas (Utenos trikotazas)
    - Paper industry: Arunas Pasvenskas (Klaipedos kartonas)

- International implications on industrial ecology

    - Utilization of cleaner production methodology on the example of dairy plant: Frantisek Bozek (Czech Republic)

    - Utilization of cleaner production on the example of poultry processing plant: Frantisek Bozek (Czech Republic)

The computer Café was the last session for Monday. The Café included demonstrations of software that are helpful to cleaner production.

Tuesday May 14

Tuesday May 14 was devoted to visiting three companies chosen for their exemplary cleaner production policies and practice. We visited a refrigerator production company "Snaige," a textile company "Alytaus tekstile," and a wine and sparkling wine production company "Alita."

Wednesday May 15

On Wednesday we completed the tour de table presentations and updates on current and completed projects. There were also several specialty presentations:

- Industries of the future—partnerships for improving energy efficiency, environmental performance and productivity: Steve Weiner (USA)

- Ceramic membrane applications in clean processes in Russia: Prof. G. Kagramanov (Russia)

- An update on Government support for clean products and processes in the United Kingdom: Prof. Jim Swindall (UK)

- Waste minimization, recalorization and recycling of solid waste in Spain: Prof. Jose Coca-Prados (Spain)

- Presentation of Lithuanian CP Center: Prof. Jurgis Staniskis (Lithuania)

- Programs of the National Science Foundation related to clean processing: Dr. Thomas Chapman (USA)

Pilot Project Updates

The Pilot Study consisted of several projects that were sponsored by member countries, some of which were collaborative (between countries) in nature. Several of these projects were completed during Phase I. The following project updates were presented in Vilnius:

- Pollution prevention tools: Dan Murray (USA)—ongoing

- Reuse of waste materials of iron-steel industries and development of sorbents from these materials for absorption of hydrogen sulfide in waste gases: Aysel Aytimtay (Turkey)—complete

- The Danish Center for industrial water management: Henrik Wenzel (Denmark)—complete

- Life cycle assessment of gasoline blending options: Teresa Mata (Portugal)—complete

Closing Session Discussion

The discussion during the closing session of the meeting focused on the transition from Phase I to Phase II. A review of the Phase II proposal that has been approved by NATO CCMS was presented by the Pilot Study Co-Director. The proposal reaffirmed the goals of Phase I and established the following goals for Phase II:

- To support the development of eco-efficiency and sustainability indicators and promote consistency and harmonization of their application;

- To examine and exchange information on state-of-the-art advancements in product design and process development in service and industrial sectors of importance to participating nations;

- To develop a web-based portal for the dissemination of pilot study results and improved awareness of related global developments; and

- To stimulate and facilitate productive collaboration among all participating nations.

The delegates discussed how to move forward in Phase II and to work together in the implementation areas described in the Phase II proposal. These implementation areas will address tools for assessment of pollution prevention and sustainability and for the design of cleaner products and processes; cleaner production techniques in priority industrial areas; and electronic dissemination of information and knowledge of cleaner products and processes.

A long discussion was held on the approach to be taken to implement a pilot project on the development and application of sustainability indicators. This pilot project was originally proposed at the fourth meeting in Oviedo, Spain, by delegates from Germany, Hungary, Lithuania and Norway. These delegates and others called for continued support for this pilot project. It was agreed that during the coming year, all delegates would provide information regarding the status of sustainability indicator development and application in their countries.

The delegate from Germany agreed to develop a framework for the provision of this information and send it to each delegate by September 1, 2002. Each delegate, using the information framework, would provide his or her information back to the German delegate by December 31, 2002. The German delegate will then prepare a summary report based on the information. At the next meeting in 2003, a "workshop" will be held as part of the meeting. This workshop will consist mainly of facilitating discussion of the issues raised in the summary report and recommendations for actions to be taken by the delegates to meet the goals of this pilot project on sustainability indicators. Initial issues raised included the need to define "sustainability" and then develop a range of indicators to measure progress towards sustainability. It was agreed that indicators could be specific and general. Indicators could be based on measures of eco-efficiency, energy efficiency, or personal "carrying capacity." Also, indicators could be industry-based, economic, environmental, or political. A final challenge will be the development of indicators with some common units for consistent application and measurement.

The delegates also reaffirmed their interest in addressing cleaner processes and products in priority service/industrial sectors. At the first meeting in Cincinnati in 1998, the delegates prioritized industries for examination. The order of priority for the top five industries was textiles, organic chemicals (including pharmaceuticals), energy production, pulp and paper, and food. The delegates emphasized that attention to chemical production, energy production, and food/agriculture, along with electronics should be priority for Phase II. The delegate from Denmark emphasized continued interest of the pilot study in product design and service sectors.

To increase information exchange among the delegates and to provide more timely and regular updates, the delegates agreed to provide mid-year reports on progress in clean products and processes in their respective nations. Each delegate will provide a report to

the Co-Director by December 31, 2002. US EPA will move ahead with enhancements to the pilot study web site during the coming year.

The delegates voted to conduct the next meeting in Italy in early May of 2003. The specific site of the meeting will be either Rome or Calabria, depending on cost and travel factors.

Subhas Sikdar, Director
Dan Murray, Co-Director
Pilot Study on Clean Products and Processes